

147878

Exhibit 3.8

Information Requests No. 47, 49

CONFIDENTIAL BUSINESS
INFORMATION

Pursuant to 40 CFR Part 2, Subpart B, Monsanto Company hereby asserts a business confidentiality claim covering this Exhibit and all documents attached thereto.

Monsanto

FROM: (NAME-LOCATION-PHONE) **B.S. Yare (694-6370)** **MCC Environmental Systems** **F2WJ**

DATE : May 4, 1990 cc: B.M. Hughes - U4E
 G.W. Mappes - U1F
 SUBJECT : Sector B Sediment and Soil Sampling W.L. Smull - G4WM
 N. Valkenburg - G&M 47
 REFERENCE : NA
 TO : R.A. Kimmerle - U4E

Geraghty and Miller may be collecting 180 sediment and soil samples in Sector B of Dead Creek. Up to 36 additional samples may be submitted for QA/QC analyses, e.g. duplicates and trip blanks. Analytical support is needed from ESC to insure accurate and timely characterization of these samples. The following analyses and detection limits are required:

ORGANICS**DETECTION LIMIT**

Volatiles	1 ppm
Semi-Volatiles	10 ppm
PCBs	1 ppm
Dioxins	1 ppb

METALS

Arsenic	1 ppm
Cadmium	1 ppm
Chromium	1 ppm
Copper	1 ppm
Lead	1 ppm
Mercury	1 ppm
Phosphorous	1 ppm
Nickel	1 ppm
Selenium	1 ppm
Thallium	1 ppm
Zinc	1 ppm

CYANIDE	1 ppm
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INDICATORS

Total Ion Chromatograms.	10 ppm
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Elemental Analysis

Carbon	%
Total Chlorine	%
Organic Chlorine	%

004637

MCA C156797

Sector B Sediment and Soil Sampling

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The volatile and semivolatile analyses must be capable of detecting the halogenated organic compounds listed in Attachment 1.

Paint filter tests and analyses for ignitability, corrosivity, reactivity and EP toxicity are also required for these samples. If a sample fails the paint filter test, analysis of the filtrate for the following parameters will be required:

<u>PARAMETER</u>	<u>DETECTION LIMIT</u>
Arsenic	500 ppm
Cadmium	100 ppm
Chromium	500 ppm
Lead	500 ppm
Mercury	20 ppm
Nickel	134 ppm
Selenium	100 ppm
Thallium	130 ppm
Cyanide	1000 ppm

The results of this testing should be summarized as shown in Attachment 2. Actual analytical results should be summarized in tabular form and included as an appendix to a report describing methods, procedures and results. All data will be supplied to Geraghty and Miller on diskettes in a compatible spread sheet or data base format for use in removal volume determinations. All lab reports must be included as an appendix to this report.

ESC will need to prepare a Quality Assurance Project Plan detailing the methods and procedures to be used in conducting these analyses. This plan must take current regulatory guidance into consideration. Method development samples may be supplied to ESC by Geraghty and Miller in early May.

Sampling may be done in late May and the analyses must be completed in 30 days. If you have any questions or need additional information, please call.

Bruce S. Yare
Bruce S. Yare

MCA 0156798

004638

Sector B Sediment and Soil Sampling

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Attachment 1. California List Halogenated Organic Compounds.
Sector B Sediment and Soil Sampling Program, Sauget, Illinois

Volatiles		Semivolatiles	
Bromodichloromethane		Bis (2-Chloroethoxy)ethane	
Bromomethane		Bis (2-Chloroethyl)ether	
Carbon Tetrachloride		Bis (2-Chloroisopropyl) ether	
Chlorobenzene		p-Chlorobenzene	
2-Chloro-1, 3-butadiene		Chlorobenzene	
Chlorodibromomethane		p-Chloro-m-cresol	
Chloroethane		2-Chloronaphthalene	
2-Chloroethyl vinyl ether		2-Chlorophenol	
Chloroform		3-Chloropropionitrile	
Chloromethane		m-Dichlorobenzene	
3-Chloropropene		o-Dichlorobenzene	
1,2-Dibromo-3-chloropropane		p-Dichlorobenzene	
1,2-Dibromomethane		3,3'-Dichlorobenzidine	
Dibromomethane		2,4-Dichlorophenol	
Trans-1,4-Dichloro-2-butene		2,6-Dichlorophenol	
Dichlorodifluoromethane		Hexachlorobenzene	
1,1-Dichloroethane		Hexachlorobutadiene	
1,2-Dichloroethane		Hexachlorocyclopentadiene	
1,1-Dichloroethylene		Hexachloroethane	
Trans-1,2-Dichloroethane		Hexachloropropene	
1,2-Dichloropropane		Hexachloropropene	
Trans-1,3-Dichloropropane		4,4'-Methylenebis	
Iodomethane		(2-Chloroaniline)	
Methylene chloride		Pentachlorobenzene	
1,1, 1,2-Tetrachloroethane		Pentachloroethane	
1,1, 2,2-Tetrachloroethane		Pentachloronitrobenzene	
Tetrachloroethane		Pentachlorophenol	
Tribromomethane		Promide	
1,1,1-Trichloroethane		1,2,4,5-Tetrachlorobenzene	
1,1,2-Trichloroethane		2,3,4,6-Tetrachlorophenol	
Trichloroethane		1,2,4-Trichlorobenzene	
Trichloromonofluoromethane		2,4,5-Trichlorophenol	
1,2,3-Trichloropropane		2,4,6-Trichlorophenol	
Vinyl chloride		Tris (2,3-dibromopropyl) -	
cis-1,3-Dichloropropene		phosphate	
Organochlorine Pesticides		Dioxins & Furans	
Aldrin	alpha-BHC	Hexachlorodibenzo-p-dioxins	
beta-BHC	delta-BHC	Hexachlorodibenzofuran	
gamma-BHC	Chlordane	Pentachlorodibenzo-p-dioxins	
DDD	ODE	Pentachlorodibenzofuran	
DDT	Dieldrin	Tetrachlorodibenzo-p-dioxins	
Endosulfan I	Endosulfan II	Tetrachlorodibenzofuran	
Endrin	Endrin aldehyde	2,3,7,8-Tetrachlorodibenzo-p-	
Heptachlor	Heptachlor epoxide	dioxin	
Isodrin	Kepone		
Methoxychlor	Toxaphene		
PCBs		Phenoxyacetic Acid Herbicides	
Aroclor 1016	Aroclor 1221	2,4-Dichlorophenoxyacetic acid	
Aroclor 1232	Aroclor 1242	Silvex	
Aroclor 1248	Aroclor 1254	2,4,5-T	
Aroclor 1260			
PCBs not otherwise specified			

004639

MCA 0156795

Sector B Sediment and Soil Sampling

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**Attachment 2. California List Decision Matrix.
Sector B Sediment and Soil Sampling Program, Sauget, Illinois**

<u>PARAMETER</u>	<u>SAMPLE</u>
Paint Filter Test	Pass/Fail
Filtrate:	
Arsenic	Pass/Fail
Cadmium	Pass/Fail
Chromium	Pass/Fail
Lead	Pass/Fail
Mercury	Pass/Fail
Nickel	Pass/Fail
Selenium	Pass/Fail
Thallium	Pass/Fail
Cyanide(free)	Pass/Fail
Ignitability	Pass/Fail
Corrosivity	Pass/Fail
Reactivity	Pass/Fail
EP Toxicity	Pass/Fail
PCBs	Pass/Fail
HOCs	Pass/Fail

MCA C156800

BEGINNING

OF LOOSE

ATTENTION
(ENVIRONMENTAL INSURANCE
LITIGATION MATERIALS)

DO NOT DESTROY OR REMOVE
WITHOUT SPECIFIC AUTHORIZATION
FROM THE LAW DEPARTMENT. CALL
314-694-6060 OR 314-694-6032 FOR
ADDITIONAL INFORMATION.

DOCUMENT

COLLECTION

③ - LD - MEASUREMENT OF SELECTED
CHEMICALS
DEAD CREEK
EPA SPLIT
LOOSE 1/8"
LOOSE 1/4"
LOOSE 1/2"
LOOSE 3/4"
LOOSE 1"
LOOSE 1 1/2"
LOOSE 2"
LOOSE 3"
LOOSE 4"
LOOSE 6"
LOOSE 8"
LOOSE 10"
LOOSE 12"
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LOOSE 222"
LOOSE 228"
LOOSE 234"
LOOSE 240"
LOOSE 246"
LOOSE 252"
LOOSE 258"
LOOSE 264"
LOOSE 270"
LOOSE 276"
LOOSE 282"
LOOSE 288"
LOOSE 294"
LOOSE 300"

MCA 0023925

004641

MEASUREMENT OF SELECTED CHEMICALS IN SOIL FROM THE DEAD CREEK SITE
ILLINOIS EPA SPLIT SAMPLESINTRODUCTION

Following media reports and subsequent Illinois EPA concern about hazardous chemicals at the Dead Creek site near Sauget, Illinois, personnel from Monsanto's W. G. Krummrich Plant and the Illinois EPA sampled several areas at the site and split the samples. The Monsanto samples were submitted to Environmental Sciences for characterization. Monsanto's concerns about the site arose from reports of high levels of polychlorinated biphenyls and phosphorus, as well as the reported presence of other chemicals, and the proximity of the site to the Krummrich Plant. These samples were taken to give both Monsanto and the Illinois EPA opportunity to confirm the reported levels found in earlier samplings by the Illinois EPA. In addition to polychlorinated biphenyls and phosphorus, several other "families" of chemicals were measured to try to identify or eliminate possible sources of the chemicals at the site.

SUMMARY

Three sediment samples and one well water sample were taken on October 2, 1980 by Monsanto and IEPA representatives. The Monsanto samples were transferred to our laboratory and analyzed for polychlorinated biphenyls, elemental phosphorus, chlorobenzenes, chlorophenols, phosphate esters, and metals (including arsenic and inorganic phosphorus). No elemental phosphorus was detected in any of the samples, which implies that phosphorus is not responsible for the "smoking earth" reported at the site. In addition, no organic chemicals were detected above the detection limits in the well water sample. However, varying amounts of the organic chemicals and metals were measured in the soil samples. One sample contained higher levels of polychlorinated biphenyls and other organic compounds, while the other two samples contained higher levels of metals. The results clearly indicate non-uniform contamination at the Dead Creek site.

DETAILSSampling

The three soil and one water samples were collected by Monsanto W. G. Krummrich plant personnel and IEPA personnel and split at the site. The Monsanto samples were transferred to the Environmental Analysis Group. In our laboratory, the sediment samples were handled according to Standard Operating Procedure (SOP) EAN-80-SOP-6, Homogenizing, Subdividing and Preserving Sediment Samples. Portions of the soil samples were transferred to Applied Sciences for the determination of metals and arsenic.

MCA OC 23926

004642

Analytical Procedures

The three soil samples were analyzed for a variety of chemicals using established procedures or methods developed and validated for the chemicals of interest in soil. The following list tabulates the methods which were used.

Analyte	Method No.	Title
Polychlorinated Biphenyls	ES-80-M-28	Determination of Polychlorinated Biphenyls in Soil and Sediment
Chlorinated Benzenes	ES-80-M-29	Determination of Chlorinated Benzenes in Soil and Sediment
Chlorinated Phenols	ES-80-M-30	Determination of Chlorinated Phenols in Soil and Sediment
Elemental Phosphorus (P ₄)	ES-80-M-24	Determination of Elemental Phosphorus (P ₄) in Soil and Sediment
Phosphate Esters	ES-80-M-5	Determination of Group I Compounds in Sediments . . .
Metals	Ref. 1, 2	Inductively Coupled Plasma (ICP) . . . Method for Trace Element Analysis of Water and Wastes
Arsenic	Ref. 3	Methods for Chemical Analysis of Water and Wastes-Arsenic

All determinations were carried out in strict accordance with these methods, except that the polychlorinated biphenyls, chlorinated benzenes and phosphate esters were measured in extracts from acidified samples to facilitate determination of chlorinated phenols in the same extracts.

The water sample was extracted in accordance with SOP EAN-80-SOP-19, Extraction of Semivolatile Organic Compounds from Water. The levels of polychlorinated biphenyls and phosphorus were determined using the analytical conditions specified in the respective method for soils listed above.

Results

The analytical results for this study are tabulated in Tables I-VI. Each table contains the results for all of the samples for a specific group of compounds. All results for the soils are in ppm (parts per million or µg/g). The results for the water sample are in ppb (parts per billion, ng/g). In general, the stated detection limits are the lowest level at which a given measurement was validated. Levels which are apparently real, but which are below the validated detection limit are presented in parentheses.

MCA 0023927

Quality Assurance

The quality assurance results (i.e., recovery and precision evaluations) for these samples have been compiled along with those of similar samples analyzed concurrently. These results are reported in Special Study ES-80-SS-27, Measurement of Selected Chemicals in Soil from the Dead Creek Site - Quality Assurance.

REFERENCES

1. Methods for Chemical Analysis of Waters and Wastes, EPA-600/4-79-020, page: Metals-6, Section 4.1.3.
2. Federal Register, Vol. 44, No. 233, December 3, 1979.
3. Methods for Chemical Analysis of Waters and Wastes, EPA-600/4-79-020, Method 206-Arsenic, pages: 206.2-1 to 206.5-2.

MCA 0023928

004644

TABLE I. PPM LEVELS OF PCBs AND ELEMENTAL PHOSPHORUS (P₄) IN DEAD CREEK SOIL AND WATER SAMPLES

ANALYTE	ES LOG NO. DATE SAMPLED LOCATION	0100301	0100303	0100305	(Water) 0100307	0041701
		10/2/80 40 yds south of Queeny Ave. Center of Creek	10/2/80 268 paces south of 0100301	10/2/80 270 paces south of 0100303	10/2/80 Well at Theresa's Greenhouse, 101 Walnut, Sauget, IL.	4/16/80 Soil Blank Mo. Bottoms St. Charles, MO.
PCB's (Cl ₂ to Cl ₆ Homologs)		13,000	240	45	ND < 1 ppb	ND < 1
P ₄		ND < 1	ND < 1	ND < 1	ND < 1 ppb	ND < 1

MCA 0023929

0046431

004646

TABLE II. PPM LEVELS OF CHLOROBENZENES IN DEAD CREEK SOIL SAMPLES

ANALYTE	ES LOG NO. DATE SAMPLED LOCATION	0100301 10/2/80 40 yds south of Queeny Ave. Center of Creek	0100303 10/2/80 268 paces south of 0100301	0100305 10/2/80 270 paces south of 0100303	0041701 4/16/80 Soil Blank Mo. Bottoms St. Charles, MO.
MONOCHLOROBENZENE		(0.9)	ND < 1	(0.3)	ND < 1
P-DICHLOROBENZENE		370	(0.3)	(0.4)	ND < 1
O-DICHLOROBENZENE		80	(0.6)	1.0	ND < 1
TRICHLOROBENZENES (3)		85	1.6	(0.7)	ND < 1
TETRACHLOROBENZENES (3)		6.1	2.4	(0.4)	ND < 1
PENTACHLOROBENZENE		ND < 1	ND < 1	ND < 1	ND < 1
HEXACHLOROBENZENE		ND < 1	1.2	ND < 1	ND < 1
NITROCHLOROBENZENES (O-, P-)		120	ND < 1	ND < 1	ND < 1

() Values in parentheses are below the validated detection limit. However, they represent levels detected with a S/N > 2.5 and can be considered semi-quantitative.

MCA 0023931

TABLE III. PPM LEVELS OF CHLOROPHENOLS IN DEAD CREEK SOIL SAMPLES

ANALYTE	ES LOG NO. DATE SAMPLED LOCATION	0100301 10/2/80 40 yds south of Queeny Ave. Center of Creek	0100303 10/2/80 268 paces south of 0100301	0100305 10/2/80 270 paces south of 0100303	0041701 4/16/80 Soil Blank Mo. Bottoms St. Charles, MO.
O-CHLOROPHENOL		3.7	ND < 1	ND < 1	ND < 1
P-CHLOROPHENOL		6.6	ND < 1	(0.9)	ND < 1
2,4-DICHLOROPHENOL		1.2	ND < 1	ND < 1	ND < 1
PENTACHLOROPHENOL		130	ND < 1	1.8	ND < 1

() Values in parentheses are below the validated detection limit. However, they represent levels detected with a S/N > 2.5 and can be considered semi-quantitative.

EPA/CERRO COPPER/ELL/PCB ATTORNEY WORK PRODUCT / ATTORNEY CLIENT PRIVILEGE

ANALYTE	ES LOG NO. DATE SAMPLED LOCATION	0100301 10/2/80 40 yds south of Queeny Ave. Center of Creek	0100303 10/2/80 268 paces south of 0100301	0100305 10/2/80 270 paces south of 0100303	0041701 4/16/80 Soil Blank Mo. Bottoms St. Charles, MO.
DIBUTYLPHENYL PHOSPHATE		330	ND < 1	(0.8)	ND < 1
BUTYLDIPHENYL PHOSPHATE		ND < 1	ND < 1	(0.8)	ND < 1
TRIPHENYL PHOSPHATE		2600	ND < 1	ND < 1	ND < 1
2-ETHYLHEXYLDIPHENYL PHOSPHATE		ND < 1	ND < 1	2.2	ND < 1
ISODECYLDIPHENYL PHOSPHATE		ND < 1	ND < 1	ND < 1	ND < 1
T-BUTYLPHENYLDIPHENYL PHOSPHATE		28	ND < 1	ND < 1	ND < 1
DI-T-BUTYLPHENYLDIPHENYL PHOSPHATE		ND < 1	ND < 1	ND < 1	ND < 1
NONYLPHENYLDIPHENYL PHOSPHATE		ND < 1	ND < 1	ND < 1	ND < 1
CUMYLPHENYLDIPHENYL PHOSPHATE		3.7	ND < 1	ND < 1	ND < 1

() Values in parentheses are below the validated detection limit. However, they represent levels detected with a S/N >2.5 and can be considered semi-quantitative.

Protected Material: Monsanto Insurance Coverage Litigation

[illegible]

TABLE V. PPM LEVELS OF METALS IN DEAD CREEK SOIL SAMPLES

ANALYTE	ES LOG NO. DATE SAMPLED LOCATION	0100301 10/2/80 40 yds south of Queeny Ave. Center of Creek	0100303 10/2/80 268 paces south of 0100301	0100305 10/2/80 270 paces south of 0100303	0041701 4/16/80 Soil Blank Mo. Bottoms St. Charles, MO.
SILVER		ND <1	42	29	ND <1
ALUMINUM		1400	5100	5300	5600
BARIUM		770	1200	1300	130
BERYLLIUM		ND <1	ND <1	ND <1	ND <1
BORON		28	160	100	27
CALCIUM		8500	9200	6200	4600
CADMIUM		5.1	60	55	3.9
COBALT		15	180	120	33
CHROMIUM		25	110	240	19
COPPER		460	28,000	18,000	19
IRON		4700	53,000	30,000	9900
MAGNESIUM		460	2200	2000	2300
MANGANESE		29	170	110	510
MOLYBDENUM		6.1	92	68	11
SODIUM		400	540	410	320
NICKEL		110	2000	1700	39
LEAD		180	2000	1600	50
PHOSPHORUS		2500	13,000	9400	610
ANTIMONY		13	240	160	29
SILICON		73	150	89	110
TIN		18	260	220	18
STRONTIUM		35	230	110	17
TITANIUM		32	110	80	37
VANADIUM		34	140	130	130
ZINC		280	32,000	18,000	56

TABLE VI. SUMMARY OF PHOSPHORUS CONTENT (PPM) OF DEAD CREEK SOIL SAMPLES

ANALYTE	ES LOG NO. DATE SAMPLED LOCATION	0100301 10/2/80 40 yds south of Queeny Ave. Center of Creek	0100303 10/2/80 268 paces south of 0100301	0100305 10/2/80 270 paces south of 0100305	0041701 4/16/80 Soil Blank Mo. Bottoms St. Charles, MO
P - ELEMENTAL, By GC/MS		ND < 1	ND < 1	ND < 1	ND < 1
P-INORGANIC, By ICP		2500	13,000	9400	610
TOTAL PHOSPHATE ESTERS, By GC/MS		3000	ND < 10	4	ND < 10

MCA 0023934

Submitted by:

Monsanto Industrial Chemicals Company
Environmental Sciences Section - NIE
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Prepared by:

Robert G. Kaley, II
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Research Group Leader

Approved by:

James P. Misure
James P. Misure
Manager, Environmental Sciences

MCA OC23935

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004651

MEASUREMENT OF SELECTED CHEMICALS IN SOIL FROM THE DEAD CREEK SITE
W. G. KRUMMRICH PLANT SAMPLINGSINTRODUCTION

Following media reports and subsequent Illinois EPA concern about the hazardous chemicals at the Dead Creek site near Sauget, Illinois, personnel from Monsanto's W. G. Krummrich Plant sampled several areas at the site. Samples were submitted to Environmental Sciences for characterization. Monsanto's concerns about the site arose from reports of high levels of polychlorinated biphenyls and phosphorus, as well as the reported presence of other chemicals, and the proximity of the site to the Krummrich Plant. These samples were taken to give Monsanto opportunity to confirm the reported levels found in earlier samplings by the Illinois EPA. In addition to polychlorinated biphenyls and phosphorus, several other "families" of chemicals were measured to try to identify or eliminate possible sources of the chemicals at the site.

SUMMARY

Eight sediment samples were taken on August 29 (1), September 15 (2), and September 18 (5), 1980 by Monsanto W. G. Krummrich plant representatives. The samples were transferred to our laboratory for analysis. The samples were analyzed for polychlorinated biphenyls, elemental phosphorus, chlorobenzenes, chlorophenols, phosphate esters, and metals (including arsenic and inorganic phosphorus). No elemental phosphorus was detected in any of the samples, which implies that phosphorus is not responsible for the "smoking earth" reported at the site. Varying amounts of the organic chemicals and metals were measured in the soil samples. The results clearly indicate non-uniform contamination at the Dead Creek site.

DETAILSSampling

The eight soil samples were collected by Monsanto W. G. Krummrich plant personnel. The Monsanto samples were transferred to the Environmental Analysis Group. In our laboratory, the sediment samples were handled according to Standard Operating Procedure (SOP) EAN-80-SOP-6, Homogenizing, Subdividing and Preserving Sediment Samples. Portions of the soil samples were transferred to Applied Sciences for the determination of metals and arsenic.

Analytical Procedures

The eight soil samples were analyzed for a variety of chemicals using established procedures or methods developed and validated for the chemicals of interest in soil. The following list tabulates the methods which were used.

004652

MCA 0023936

Analyte	Method No.	Title
Polychlorinated Biphenyls	ES-80-M-28	Determination of Polychlorinated Biphenyls in Soil and Sediment
Chlorinated Benzenes	ES-80-M-29	Determination of Chlorinated Benzenes in Soil and Sediment
Chlorinated Phenols	ES-80-M-30	Determination of Chlorinated Phenols in Soil and Sediment
Elemental Phosphorus (P ₄)	ES-80-M-24	Determination of Elemental Phosphorus (P ₄) in Soil and Sediment
Phosphate Esters	ES-80-M-5	Determination of Group I Compounds in Sediments. . .
Metals	Ref. 1, 2	Inductively Coupled Plasma (ICP). . . Method for Trace Element Analysis of Water and Wastes
Arsenic	Ref. 3	Methods for Chemical Analysis of Water and Wastes - Arsenic

All determinations were carried out in strict accordance with these methods, except that the polychlorinated biphenyls, chlorinated benzenes and phosphate esters were measured in extracts from acidified samples to facilitate determination of chlorinated phenols in the same extracts.

Results

The analytical results for this study are tabulated in Tables I-VI. Each table contains the results for all of the samples for a specific group of compounds. All results for the soils are in ppm (parts per million or µg/g). In general, the stated detection limits are the lowest level at which a given measurement was validated. Levels which are apparently real, but which are below the validated detection limit are presented in parentheses.

Quality Assurance

The quality assurance results (i.e., recovery and precision evaluations) for these samples have been compiled along with those of similar samples analyzed concurrently. These results are reported in Special Study ES-80-SS-27, Measurement of Selected Chemicals in Soil from the Dead Creek Site - Quality Assurance.

REFERENCES

1. Methods for Chemical Analysis of Waters and Wastes, EPA-600/4-79-020, page: Metals - 6, Section 4.1.3.
2. Federal Register, Vol. 44, No. 233, December 3, 1979.
3. Methods for Chemical Analysis of Waters and Wastes, EPA-600/4-79-020, Method 206 - Arsenic, pages: 206.2-1 to 206.5-2.

MCA 0023937

004654

TABLE 1. PPM LEVELS OF PCBs AND ELEMENTAL PHOSPHORUS (P₄) IN DEAD CREEK SOIL SAMPLES

ANALYTE	ES LOG NO.	0091541	0091542	0091543	0091907	0091908	0091909	0091911	0041701	Soil Blank Mo. Bottoms St. Charles, MO
	DATE SAMPLED LOCATION	8/29/80 100' from Judith Ln.	9/15/80 North Start	9/15/80 300' from start	9/18/80 #9	9/18/80 #10	9/18/80 #11	9/18/80 #14	4/16/80 #15	
PCB's (Cl ₂ to Cl ₆ Homologs)		29	5000	190	4600	150	730	400	280	ND<1
P ₄		ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1

Protected Material: Monsanto Insurance Coverage Litigation

Page 1

TABLE II. PPM LEVELS OF CHLOROBENZENES IN DEAD CREEK SOIL SAMPLES

ANALYTE	ES LOG NO. DATE SAMPLED LOCATION	0091541 8/29/80 100' from Judith Ln.	0091542 9/15/80 North Start	0091543 9/15/80 300' from start	0091907 9/18/80 #9	0091908 9/18/80 #10	0091909 9/18/80 #11	0091910 9/18/80 #14	0091911 9/18/80 #15	0041701 4/16/80 Soil Blank Mo. Bottoms St. Charles, Mo.
MONOCHLOROBENZENE		NA	NA	NA	(0.9)	2.0	(0.2)	ND<1	(0.1)	ND<1
P-DICHLOROBENZENE		NA	NA	NA	34	4.0	3.4	2.5	(0.7)	ND<1
O-DICHLOROBENZENE		NA	NA	NA	14	(0.5)	1.1	2.3	(0.2)	ND<1
TRICHLOROBENZENES (3)		NA	NA	NA	22	2.0	5.3	3.5	1.1	ND<1
TETRACHLOROBENZENES (3)		NA	NA	NA	4.0	(0.5)	2.1	(0.7)	(0.6)	ND<1
PENTACHLOROBENZENE		NA	NA	NA	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
HEXACHLOROBENZENE		NA	NA	NA	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
NITROCHLOROBENZENES (O-, P-)		NA	NA	NA	ND<5	ND<1	1.2	ND<1	ND<1	ND<1

NA - Not Analyzed

() Values in parentheses are below the validated detection limit. However, they represent levels detected with a S/N >2.5 and can be considered semi-quantitative.

004656

TABLE III. PPM LEVELS OF CHLOROPHENOLS IN DEAD CREEK SOIL SAMPLES

ANALYTE	ES LOG NO. DATE SAMPLED LOCATION	0091541 8/29/80 100' from Judith Ln.	0091542 9/15/80 North Start	0091543 9/15/80 300' from start	0091907 9/18/80 #9	0091908 9/18/80 #10	0091909 9/18/80 #11	0091910 9/18/80 #14	0091911 9/18/80 #15	0041701 4/16/80 Soil Blank Mo. Bottom St. Charles
O-CHLOROPHENOL		NA	NA	NA	17	ND<1	1.7	ND<1	ND<1	ND<1
P-CHLOROPHENOL		NA	NA	NA	20	ND<1	1.7	1.4	ND<1	ND<1
2,4-DICHLOROPHENOL		NA	NA	NA	4.6	ND<1	ND<1	ND<1	ND<1	ND<1
PENTACHLOROPHENOL		NA	NA	NA	32	ND<1	1.1	ND<1	ND<1	ND<1

NA = Not analyzed

() Values in parentheses are below the validated detection limit. However, they represent levels detected with a S/N >2.5 and can be considered semi-quantitative.

MCA 0023940

TABLE IV. PPM LEVELS OF PHOSPHATE ESTERS IN DEAD CREEK SOIL SAMPLES

ANALYTE	ES LOG NO. DATE SAMPLED LOCATION	0091541 8/29/80 100' from Judith Ln.	0091542 9/15/80 North Start	0091543 9/15/80 300' from start	0091907 9/18/80 #9	0091908 9/18/80 #10	0091909 9/18/80 #11	0091910 9/18/80 #14	0091911 9/18/80 #15	0041701 4/16/80 Soil Blank Mo. Bottoms St. Charles, MO.
DIBUTYLPHENYL PHOSPHATE		ND<1	ND<100	ND<10	60	ND<1	ND<1	1.0	ND<1	ND<1
BUTYL DIPHENYL PHOSPHATE		NA	NA	NA	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
TRIPHENYL PHOSPHATE		(0.3)	150	18	200	3.0	ND<1	ND<1	ND<1	ND<1
2-ETHYLHEXYLDIPHENYL PHOSPHATE		3.5	17	11	ND<1	ND<1	1.0	(0.5)	ND<1	ND<1
ISODECYLDIPHENYL PHOSPHATE		ND<1	ND<100	ND<10	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
T-BUTYLPHENYLDIPHENYL PHOSPHATE		ND<1	ND<100	ND<10	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
DI-T-BUTYLPHENYLPHENYL PHOSPHATE		NA	NA	NA	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
NONYLPHENYLDIPHENYL PHOSPHATE	MCA	ND<2	ND<200	ND<20	ND<1	1.0	ND<1	ND<1	ND<1	ND<1
CUMYLPHENYLDIPHENYL PHOSPHATE	0023941	ND<1	ND<100	ND<10	2.6	2.4	2.4	2.2	2.6	ND<1

NA - Not analyzed

() Values in parentheses are below the validated detection limit. However, they represent levels detected with a S/N >2.5 and can be considered semi-quantitative.

004658

TABLE V. LEVELS OF METALS IN LEAD CHLOR SOIL SAMPLES

ANALYTE	ES LOG NO. DATE SAMPLED LOCATION	0091541 8/29/80 100' from Judith Ln.	0091542 9/15/80 North Start	0091543 9/15/80 300' from start	0091907 9/18/80 #9	0091908 9/18/80 #10	0091909 9/18/80 #11	0091910 9/18/80 #14	0091911 9/18/80 #15	0041701 4/16/80 Soil Blank Mo. Bottoms St. Charles, MO
SILVER		17	ND<1	3.3	ND<1	20	20	19	4.2	ND<1
ALUMINUM		2300	720	720	2700	2400	3100	3600	3900	5600
BARIUM		210	2000	640	2400	230	940	1000	1100	120
BERYLLIUM		ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
BORON		68	13	21	36	100	78	76	72	27
CALCIUM		2500	2700	2200	13,000	14,000	6200	9200	5600	4600
CADMIUM		60	5.9	17	5.1	40	42	45	53	3.9
COBALT		67	8.2	13	30	120	85	89	81	33
CHROMIUM		44	19	61	29	88	110	130	51	19
COPPER		25,000	2700	16,000	590	8900	13,000	12,000	14,000	19
IRON		24,000	2000	2600	8700	31,000	28,000	28,000	28,000	9900
MAGNESIUM		1000	400	310	1300	1700	1700	2400	2100	2300
MANGANESE		45	15	9.3	60	210	91	140	90	510
MOLYBDENUM		63	9.5	38	11	54	39	38	47	11
SODIUM		350	690	710	420	510	400	440	360	320
NICKEL		950	140	260	120	1100	900	1100	1400	39
LEAD		1000	390	1400	150	1200	1000	1100	1500	50
PHOSPHORUS		4400	770	2400	1900	7400	7000	6500	6700	610
ANTIMONY		130	23	54	22	160	93	88	120	29
SILICON		210	320	270	94	83	91	63	95	110
TIN		76	27	71	19	71	78	91	62	18
STRONTIUM		64	35	42	24	130	120	110	81	17
TITANIUM		49	60	94	36	56	50	47	51	37
VANADIUM		46	13	14	67	120	92	100	110	130
ZINC		20,000	1400	5900	380	19,000	11,000	10,000	18,000	56
ARSENIC (By AA)		NA	NA	NA	180	50	90	50	30	5

MCA 0023942

TABLE VI. SUMMARY OF PHOSPHORUS CONTENT (PPM) OF DEAD CREEK SOIL SAMPLES

ANALYTE	ES LOG NO. DATE SAMPLED LOCATION	0091541 8/29/80 100' from Judith Ln.	0091542 9/15/80 North Start	0091543 9/15/80 300' from start	0091907 9/18/80 #9	0091908 9/18/80 #10	0091909 9/18/80 #11	0091910 9/18/80 #14	0091911 9/18/80 #15	0041701 4/16/80 Soil Blank Mo. Bottoms St. Charles, MO
P - ELEMENTAL, By GC/MS		ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
P-INORGANIC, By ICP		4400	770	2400	1900	7400	7000	6500	6700	610
TOTAL PHOSPHATE ESTERS, By GC/MS		4	170	29	260	6.4	3.4	3.7	2.6	ND<10

4CA 0023943

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MCA 0023944

MEASUREMENT OF SELECTED CHEMICALS IN SOIL FROM THE DEAD CREEK SITE - QUALITY ASSURANCE

INTRODUCTION

Following media reports and subsequent Illinois EPA concern about hazardous chemicals at the Dead Creek site near Sauget, Illinois, personnel from Monsanto's W. G. Krummrich Plant sampled several areas at the site. Samples were submitted to Environmental Sciences for analyses for polychlorinated biphenyls, elemental phosphorus, chlorinated benzenes, chlorinated phenols, phosphate esters, and metals. During the various determinations, replicates and spiked samples were analyzed to evaluate the performance of the method used for these particular samples.

SUMMARY

This report summarizes the quality assurance results obtained for various samples analyzed during the course of this project. The accuracy (recovery from spiked samples) and precision (relative standard deviation of replicate determinations) results are tabulated herein. Although it would be difficult to summarize the overall performance of the methods for all the analytes, in general, the methods performed at the recovery and precision levels established during method validation.

DETAILS

Analytical Methods

The soil samples were analyzed for the various chemicals using established procedures or methods developed and validated for the chemicals of interest in soil. The following list tabulates the methods which were used.

Analyte	Method No.	Title
Polychlorinated Biphenyls	ES-80-M-28	Determination of Polychlorinated Biphenyls in Soil and Sediment
Chlorinated Benzenes	ES-80-M-29	Determination of Chlorinated Benzenes in Soil and Sediment
Chlorinated Phenols	ES-80-M-30	Determination of Chlorinated Phenols in Soil and Sediment
Elemental Phosphorus (P ₄)	ES-80-M-24	Determination of Elemental Phosphorus (P ₄) in Soil and Sediment
Phosphate Esters	ES-80-M-5	Determination of Group I Compounds in Sediments . . .
Metals	Ref. 1, 2	Inductively Coupled Plasma (ICP) . . . Method for Trace Element Analysis of Water and Wastes
Arsenic	Ref. 3	Methods for Chemical Analysis of Water and Wastes - Arsenic

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All determinations were carried out in strict accordance with these methods, except that the polychlorinated biphenyls, chlorinated benzenes and phosphate esters were measured in extracts from acidified samples to facilitate determination of chlorinated phenols in the same extracts.

Results

The results for the determinations of the compounds of interest have been reported in Special Studies ES-80-SS-24, 25, and 26, Measurement of Selected Chemicals in Soil from the Dead Creek Site . . . This Special Study is a compilation of the quality assurance results for all three Special Studies.

Quality Assurance

The recovery and precision results for the determinations are tabulated in Tables I-V. Each table contains the results for all quality assurance samples for a specific group of compounds. Recovery results are reported as percent recovery, calculated as

$$\% \text{ Recovery} = \frac{\text{Concentration (sample + spike)} - \text{average concentration (sample)}}{\text{Concentration (spike added)}} \times 100$$

Precision results are reported as percent relative standard deviation (RSD) for replicate determinations.

The tables present the recovery and precision results in concentration ranges (1-10 ppm to 10,000 - 100,000 ppm). The entries are averages of all values for all samples which had either recovery or precision evaluated in that range. All values are for actual samples except the metals recovery results, which are for spiked blank soil. In the recovery column, NE means Not Evaluated, i.e., no samples were spiked in that concentration range, and ND means Not Determinable, i.e., the spiking level was too low (usually <50%) compared to the level actually in the sample. In the precision columns, NE means Not Evaluated, i.e., no replicates were analyzed which contained the analyte in that concentration range.

More detailed compilations of the accuracy and precision results can be found in Reference 4.

REFERENCES

1. Methods for Chemical Analysis of Waters and Wastes, EPA-600/4-79-020, page: Metals - 6, Section 4.1.3.
2. Federal Register, Vol. 44, No. 233, December 3, 1979.
3. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Method 206 - Arsenic, pages: 206.2-1 to 206.5-2.
4. RGK NBP 1914831

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RECOVERY AND PRECISION

TABLE 1. PCBs AND ELEMENTAL PHOSPHORUS (P₄) IN DEAD CREEK SOIL SAMPLES

ANALYTE	LEVEL	1-10 ppm		10-100 ppm		100-1,000 ppm		1,000-10,000 ppm		10,000-100,000 ppm	
		% Rec	% RSD	% Rec	% RSD	% Rec	% RSD	% Rec	% RSD	% Rec	% RSD
PCB's (Cl ₂ to Cl ₆ Homologs)		ND	NE	70%	17%	120%	18%	77%	58%	NE	0%
P ₄		56%	NE	NE	NE	NE	NE	NE	NE	NE	NE

RECOVERY AND PRECISION

TABLE II. CHLOROBENZENES IN DEAD CREEK SOIL SAMPLES

ANALYTE	LEVEL	1-10		10-100		100-1,000	
		% Rec	ppm % RSD	% Rec	ppm % RSD	% Rec	% RSD
MONOCHLOROBENZENE		105%	NE	110%	NE	100%	NE
P-DICHLOROBENZENE		120%	21%	125%	64%	120%	NE
O-DICHLOROBENZENE		125%	16%	120%	NE	120%	8%
TRICHLOROBENZENES (3)		96%	14%	110%	13%	120%	NE
TETRACHLOROBENZENES (3)		110%	9%	120%	NE	130%	NE
PENTACHLOROBENZENE		140%	12%	120%	NE	140%	NE
HEXACHLOROBENZENE		135%	13%	90%	NE	110%	NE
NITROCHLOROBENZENES (O-,P-)		125%	37%	120%	NE	120%	26%

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RECOVERY AND PRECISION

TABLE III. CHLOROPHENOLS IN DEAD CREEK SOIL SAMPLES

ANALYTE	LEVEL		1-10 ppm		10-100 ppm		100-1,000 ppm	
		% Rec	% RSD	% Rec	% RSD	% Rec	% RSD	
O-CHLOROPHENOL		19%	34%	64%	NE	58%	NE	
P-CHLOROPHENOL		36%	26%	16%	NE	30%	NE	
2,4-DICHLOROPHENOL		66%	47%	59%	NE	50%	NE	
PENTACHLOROPHENOL		140%	46%	40%	NE	36%	20%	

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RECOVERY AND PRECISION

TABLE IV. PHOSPHATE ESTERS IN DEAD CREEK SOIL SAMPLES

ANALYTE	LEVEL		1-10 ppm		10-100 ppm		100-1,000 ppm		1,000-10,000	
			% Rec	% RSD	% Rec	% RSD	% Rec	% RSD	% Rec	% RSD
DIBUTYLPHENYL PHOSPHATE			75%	NE	130%	NE	120%	12%	NE	NE
BUTYLDIPHENYL PHOSPHATE			120%	42%	115%	NE	NE	NE	NE	NE
TRIPHENYL PHOSPHATE			120%	89%	120%	NE	115%	NE	NE	6%
2-ETHYLHEXYLDIPHENYL PHOSPHATE			90%	47%	110%	NE	115%	NE	NE	NE
ISODECYLDIPHENYL PHOSPHATE			NE	NE	NE	NE	NE	NE	NE	NE
1-BUTYLPHENYLDIPHENYL PHOSPHATE			70%	NE	92%	100%	100%	NE	NE	NE
DI-1-BUTYLPHENYLPHENYL PHOSPHATE			88%	NE	96%	NE	NE	NE	NE	NE
NONYLPHENYLDIPHENYL PHOSPHATE			84%	8%	76%	NE	96%	NE	NE	NE
CUMYLPHENYLDIPHENYL PHOSPHATE			62%	21%	76%	NE	88%	NE	NE	NE

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RECOVERY AND PRECISION

TABLE V. METALS IN DEAD CREEK SOIL SAMPLES

ANALYTE	LEVEL	1-10 ppm % Rec	1-10 ppm % RSD	1-100 ppm % Rec	1-100 ppm % RSD	100-1,000 ppm % Rec	100-1,000 ppm % RSD	1000-10,000 ppm % Rec	1000-10,000 ppm % RSD	10,000-100,000 ppm % Rec	10,000-100,000 ppm % RSD
SILVER		NE	NE	NE	46%	NE	NE	NE	NE	NE	NE
ALUMINUM		ND	NE	ND	NE	ND	NE	NE	6.5%	NE	NE
BARIUM		ND	NE	ND	NE	89%	37%	NE	0%	NE	NE
BERYLLIUM		98%	NE	98%	NE	94%	NE	NE	NE	NE	NE
BORON		0%	NE	65%	19%	81%	3%	NE	NE	NE	NE
CALCIUM		ND	NE	ND	NE	ND	NE	NE	8.3%	NE	7.5%
CADMIUM		89%	5.2%	97%	21%	96%	NE	NE	NE	NE	NE
COBALT		51%	NE	115%	6.5%	97%	5.1%	NE	NE	NE	NE
CHROMIUM		27%	NE	109%	20%	91%	6.4%	NE	NE	NE	NE
COPPER		0%	NE	143%	66%	90%	NE	NE	NE	NE	11%
IRON		ND	NE	ND	NE	ND	NE	NE	NE	NE	8.1%
MAGNESIUM		ND	NE	ND	NE	ND	NE	NE	7.8%	NE	NE
MANGANESE		ND	NE	ND	13%	ND	10%	NE	NE	NE	NE
MOLYBDENUM		53%	NE	83%	11%	83%	NE	NE	NE	NE	NE
SODIUM		ND	NE	ND	NE	ND	11%	NE	NE	NE	NE
NICKEL		0%	NE	108%	14%	91%	13%	NE	4.5%	NE	NE
LEAD		0%	NE	165%	21%	93%	NE	NE	6.5%	NE	NE
PHOSPHORUS		ND	NE	ND	NE	ND	10%	NE	17%	NE	7.9%
ANTIMONY		0%	NE	27%	2.9%	27%	13%	NE	NE	NE	NE
SILICON		ND	NE	ND	NE	0%	49%	NE	NE	NE	NE
TIN		88%	NE	85%	5.6%	96%	5.4%	NE	NE	NE	NE
STRONTIUM		81%	NE	105%	3.3%	94%	6.5%	NE	NE	NE	NE
TITANIUM		ND	NE	99%	30%	30%	1.3%	NE	NE	NE	NE
VANADIUM		ND	NE	ND	13%	120%	11%	NE	NE	NE	NE
ZINC		ND	NE	139%	34%	87%	NE	NE	8.9%	NE	16%
ARSENIC (BY AA)		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

PCA 0023951

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MCA 0023952

END OF LOOSE DOCUMENT COLLECTION

MCA 0023953

SAUGET SITES - DEAD CREEK, SECTOR B

GOAL: Define If A Removal Of Contaminated Sediments To The Chemical Waste Management Landfill At Emelle Is Possible And, If So, Implement Same.

1. IEPA Position Definition

*Contact IEPA (McCombs) and determine approval status of Cerro Removal.

If Negative - Terminate Project

If Positive - Set up meeting with IEPA for Varnado, Smull and McCombs to discuss a similar project. Contact Gilhousen to determine if Enviro. Law wishes to be represented in this and possible future meetings. Also if we should contact the IAG relative to this project and when and how.

*Meet with IEPA, express our concern that the community reaction to a removal on sector A, an industrial area, and no action on sector B, a commercial/residential area, can be expected to be severely negative towards local industries and the Agencies. Additionally it is our perception that there is not a strong technical base on which to defend the situation. Define if IEPA has a positive interest in doing a similar removal on Sector B, if Monsanto would agree to fund and manage the project.

If Negative - Terminate Project

If Positive - Define and Detail Basis in this and future meetings. Major issues are:

- a. Access, can IEPA use existing agreement for sampling and removal access.
- b. What form of agreement will IEPA require for the work. We need to develop our proposal, letter agreement? or whatever.
- c. Regulatory hurdles, PCB content averaging, disposal of dewatering water, etc.
- d. Define Agency waste definition analytical requirements (CMW may have additional requirements). At this time we would expect to need PCB, 2,3,7,8 TCDD, landban organics, metals, moisture content. (Also need to define moisture level required to pass paint filter test.
- e. Timing. The 11/8/90 landban deadline is a desirable, if not necessary, project completion date.

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MCO 7683597

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2. Funding

Prepare EEAR against the Executive Division for \$400k to cover funding for study. Issue second EEAR, now anticipated to be in the \$10M range for actual removal.

3. Removal Feasibility and Scope Definition

Request G & M to prepare proposal for defining the project, including coring and sampling. Use a fast track basis.

Define laboratory for analytical work including doing same via EASC if necessary to achieve rapid turnarounds.

Define via McCombs ability of plant to provide field supervision of contractors. If not possible, arrange for Engineering or contract support.

Define CMW capability, pricing, and requirements to transport and handle the material at Emelle. At this time the actual removal work would be held out separately as a lump sum bid contract.

4. Community Relations

Meet with MCC and WGK community relations and develop CR plan.

MCA 0156813

MCO 7683598

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in Dead Creek. The results of this investigation are documented in the St. John Report. The snow fence was later replaced with a chain link and barbed wire fence. The installation of this fence was authorized by the USEPA, and was completed in October, 1982.

Prior to the IEPA investigation in 1980, the City of Cahokia Health Department received complaints from area residents concerning discharges from Cerro Copper Product (Cerro) entering CS-8. In 1975, IEPA visited the site in order to determine if these discharges were occurring. Investigators observed discoloration in the creek and along the banks similar to what was later observed in the holding ponds at Cerro. One water sample was collected by IEPA from the creek immediately south of Queeny Avenue. Analysis of this sample indicated the presence of copper (0.3 ppm), iron (3.2 ppm), and mercury (0.1 ppb). The culvert under Queeny Avenue was sealed sometime in the early 1970's by Cerro Copper and the Monsanto Chemical Company for the purpose of restricting flow from the holding ponds at Cerro (Creek Sector A). The holding ponds were also regraded to the north to direct their flow to an interceptor discharging to the Sauget Wastewater Treatment Plant. The investigators concluded that flow through the blocked culvert had occurred, although the direction of flow could not be determined because no flow was evident at the time of the inspection.

The IEPA hydrogeological study, conducted in 1980, included collecting 20 surface sediment samples for analysis from CS-8 (Figure B-1). Analyses of samples from the northern portion of CS-8 are presented in Table B-1. Samples x106, x119, x120, x125, and x126 showed PCBs in concentrations ranging from 1.1 to 10,000 parts per million (ppm). Sample x125, taken adjacent to the former Waggoner Company operation, contained additional organic contaminants, including alkylbenzenes (370 ppm), dichlorobenzene (660 ppm), trichlorobenzene (78 ppm), dichlorophenol (170 ppm), and hydrocarbons (21,000 ppm). These contaminants were not detected in other surface sediment samples in the northern portion of CS-8 during this

B-2

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MCA C156815

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CREEK SECTOR B - DEAD CREEK

Site Description

Creek Sector B (CS-B) includes the portion of Dead Creek lying between Queeny Avenue and Judith Lane in Sauget, Illinois. Three other sites in the Dead Creek Project are located adjacent to CS-B. These include Site G to the northwest, Site L to the northeast, and Site M to the southeast. All of these sites have been identified at one time or another as possible sources of pollution in CS-B. Presently, CS-B and Site M are enclosed by a chain link fence which was installed by the USEPA in 1982. The banks of the creek are heavily vegetated, and debris is scattered throughout the northern one-half of CS-B. Culverts at Queeny Avenue and Judith Lane have been blocked in order to prevent any release of contaminants to the remainder of the creek, although the adequacy of these blocks has been questioned several times. Water levels in the creek vary substantially depending on rainfall, and during extended periods of no precipitation, the creek becomes a dry ditch.

Site History and Previous Investigations

The IEPA initially became aware of environmental problems at CS-B in May, 1980 when several complaints were received concerning smouldering and fires observed the creek bed. In August, 1980, a local resident's dog died, apparently of chemical burns resulting from contact with materials in the ditch. Following this incident, the IEPA conducted preliminary sampling to determine the cause of these problems in CS-B. Chemical analysis of these samples indicated high levels of PCBs, phosphorus, and heavy metals, and the IEPA subsequently authorized the installation of fencing in order to prevent public access to the creek. In September 1980, the Illinois Department of Transportation (IDOT) completed installation of 7000 feet of snow fence with warning signs around CS-B and Site M. The IEPA subsequently performed a preliminary hydrogeological investigation in the area in an attempt to identify the sources of pollution

B-1

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MCA 0156814

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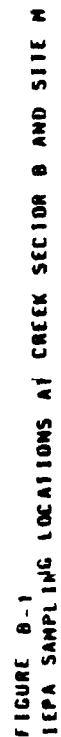


FIGURE 8-1
TEPA SAMPLING LOCATIONS AT CREEK SECTION 8 AND SITE M

MCO 7683601

TABLE B-1: ANALYSIS OF SOIL SAMPLES IN THE
NORTHERN PORTION OF CREEK SECTION 8
(COLLECTED BY IEPA 9-8-80 THROUGH 10-25-80)

PARAMETERS	SAMPLE LOCATIONS														
	n106	n113	n114	n115	n116	n117	n118	n119	n120	n125	n126				
Aluminum	18,000	6,400	9,000	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300				
Arsenic	300	23	18	9	16	15	15	15	15	15	15				
Barium	2,400	1,600	3,400	300	400	1,600	1,600	510	1,200	2,500	5,000				
Beryllium	-	-	-	-	-	-	-	1	1	-	2				
Boron	400	-	-	-	-	-	6	7	3	6	76				
Cadmium	11,000	14,000	11,000	120	5,000	1,600	6,000	7,300	72,000	6,900	19,000				
Calcium	250	400	120	130	130	-	-	36	38	50	100				
Cobalt	100	-	40	-	-	-	-	9	10	9	50				
Copper	3,000	4,800	22,000	270	160	1,000	1,000	100	150	1,000	44,000				
Lead	35,000	15,000	48,000	12,000	2,400	4,300	17,500	17,500	18,700	7,000	107,000				
Magnesium	3,600	2,000	3,200	80	80	100	100	43	60	260	2,000				
Manganese	4,000	2,800	5,000	2,600	1,200	1,000	1,000	4,500	4,300	300	3,700				
Mercury	120	130	150	60	40	40	50	260	350	45	200				
Nickel	30	1.7	4	0.2	2	2	2	-	-	-	-				
Phosphorus	2,500	1,700	2,400	140	140	-	-	-	80	130	3,000				
Potassium	1,400	1,300	1,500	2,300	850	1,200	1,200	1,800	1,200	2,000	8,900				
Silver	2,800	700	1,100	360	150	150	180	110	225	40	100				
Sodium	100	100	200	40	40	-	-	12	140	50	1,400				
Strontium	61,000	20,000	71,000	2,500	-	-	300	2,000	700	1,500	62,000				
Zinc	-	-	150	-	-	-	-	1.1	80	10,000	350				
PCBs	-	-	-	-	-	-	-	-	-	-	-				
Alkylbenzenes	-	-	-	-	-	-	-	-	-	-	-				
Dichlorobenzene	-	-	-	-	-	-	-	-	-	-	-				
Bichlorophenol	-	-	-	-	-	-	-	-	-	-	-				
Nitrocarbons	-	-	-	-	-	-	-	-	-	-	-				
Naphthalene	-	-	-	-	-	-	-	-	-	-	-				
Trichlorobenzene	-	-	-	-	-	-	-	-	-	-	-				

NOTE: All results in ppm
Blank indicates parameter not analyzed
- Indicates below detection limits

investigation. In general, inorganic analysis of these samples indicated high levels of several metals in comparison with background conditions (Table B-3, sample x121).

Subsurface soil samples were also collected by IEPA from one location in the northern portion of CS-8 during the 1980 investigation. Analyses of samples from boring P-1 are included in Table B-2. Results indicated the presence of PCBs to a depth of seven feet, and other organic contaminants to a depth of three feet. PCB concentrations ranged from 9,200 ppm near the surface to 53 ppm at depths greater than 4 feet and up to 7 feet. Other organic contaminants were detected at concentrations ranging from 12,000 ppm near the surface to 240 ppm at 2.5 feet. These results indicate non-uniform contaminant deposition in the northern portion of CS-8, which is common in riverine systems. The above data indicate that historical release(s) of contaminants to the northern portion of CS-8 did occur. However, the horizontal and vertical extent of the resulting contamination has not been fully defined.

Analyses of sediment samples from the southern portion of CS-8 are summarized in Table B-3. Sample x121 was taken from soil outside the creek bed to establish background conditions. Samples x107, x122, and x127 contained PCBs at concentrations ranging from 73 to 540 ppm. Sample x122 also showed diclorobenzene (0.35 ppm). This was the only organic contaminant other than PCBs detected in samples from the southern portion of CS-8. Several metals, including arsenic, cadmium, chromium, copper, lead, and zinc, were detected at levels significantly above background concentrations in all samples. However, the metal concentrations were comparable to concentrations detected in samples of sediment taken in the northern portion of CS-8. All of the samples were collected from the creek bed adjacent to, or downstream from Site M, which is an old sand pit excavated by the H.H. Hall Construction Company in approximately 1950. Hazardous materials were not reported to have been disposed of at Site M.

In October, 1980 IEPA and Monsanto Chemical Company cooperatively

B-5

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TABLE B-2: ANALYSIS OF SUBSURFACE SOIL
 SAMPLES AT BORING LOCATION P-1
 IN CREEK SECTOR B. (COLLECTED BY
 IEPA 9-8-80)

PARAMETERS	SAMPLE DEPTH						
	0'-1'	1'-2'	2'-3'	3'-4'	4'-5'	5'-6	6'-7'
Biphenyl	6,000	9,000	1,100				
Chloronitrobenzene	200	240					
Dichlorobenzene	12,000	8,900	240				
PCBs	9,200	2,600	928-6	240	53	53	54
Trichlorobenzene	380	3,700	590				
Xylene	540	250					

NOTE: All results in ppm
 Blanks indicate below detection limits

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MCO 7683604

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TABLE B-3: ANALYSIS OF SOIL SAMPLES IN THE
SOUTHERN PORTION OF CREEK SECTOR B
(COLLECTED BY IEPA 9-8-80 THROUGH 10-25-80)

PARAMETERS	SAMPLE LOCATIONS											
	x107	x108	x109	x110	x111	x112	x121	x122	x127			
Aluminum		8,000	9,100	7,000	8,000	8,600						
Arsenic	6,000	44	25	67	80	50						
Barium	4,800	3,800	1,600	4,300	1,800	8,000	230	5,500	2,500			
Beryllium	-	-	-	-	-	-	-	-	2			
Boron	-	-	-	-	-	-	-	-	-			
Cadmium	70	-	200	40	100	100	1	35	50			
Calcium	11,000	10,000	24,000	16,000	13,000	30,000	11,000	15,000	8,000			
Chromium	360	300	-	140	50	50	-	50	340			
Cobalt	30	30	20	-	-	30	9	15	30			
Copper	32,000	31,000	7,700	22,000	15,000	41,000	100	21,900	28,000			
Iron	70,000	58,000	75,000	67,000	68,000	52,000	16,500	50,000	63,000			
Lead	24,000	2,000	1,700	2,000	2,000	9,100	-	1,700	1,700			
Magnesium	2,900	3,900	3,600	4,100	4,000	4,000	5,900	3,800	2,700			
Manganese	150	150	300	200	160	300	370	190	150			
Mercury	-	1.7	3	3.3	3.2	6	-	-	-			
Nickel	3,500	3,000	900	1,900	2,000	2,700	120	1,700	-			
Phosphorus	7,040	-	-	-	-	-	-	-	4,700			
Potassium	1,200	1,500	1,700	1,300	1,600	1,200	1,900	960	1,000			
Silver	40	-	-	-	-	-	-	30	40			
Sodium	1,700	900	900	700	1,000	1,600	80	630	700			
Strontium	180	200	130	160	160	430	32	190	130			
Vanadium	60	-	-	70	100	-	25	45	45			
Zinc	25,000	22,000	27,000	25,000	47,000	52,000	230	19,900	28,000			
PCBs	120	-	-	-	-	-	-	540	73			
Dichlorobenzene	-	-	-	-	-	-	-	0.35	-			

NOTE: All results in ppm
Blanks indicate that parameter not analyzed
- Indicates parameter is below detector limit

collected three sediment samples from CS-8 in order to confirm results of earlier sampling done by IEPA. SD-1 was collected from the creek bed 40 yards-south of Queeny Avenue. This location is adjacent to the former Waggoner Company building and also near an old outfall (effluent pipe) from the Midwest Rubber Company. Samples SD-2 and SD-3 were collected approximately 220 yards south of SD-1, in the central portion of CS-8. Results of these samples, including a blank soil sample collected from the Missouri Bottoms in St. Charles, Mo., are presented in Tables B-4 and B-5. PCBs (45-13,000 ppm) were found in all three samples from CS-8, as were several chlorinated benzenes. Chlorinated phenols and phosphate ester were detected in samples SD-1 and SD-3, but were not found in SD-2. The analysis of these samples for inorganic parameters detected generally higher levels of inorganic parameters in SD-2 and SD-3 than those for SD-1 and the soil blank. These results clearly indicate differential contamination in CS-8, with SD-1 showing high levels of PCBs and other organic compounds, whereas SD-2 and SD-3 contained higher levels of metals.

IEPA personnel also collected two sediment samples from CS-8 in December, 1982, as part of an area-wide dioxin sampling effort managed by the USEPA which also included Site O. The first sample was collected along the east bank of the creek, approximately 80 yards south of Queeny Avenue. Previous sampling conducted by IEPA in this area had shown high concentrations of PCBs. The second sample was collected along the west bank of the creek, approximately 50 yards south of Queeny Avenue. Both samples were analyzed specifically for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) by a USEPA contract laboratory. The first sample showed a quantified level (0.54 ppb) of TCDD, and the second sample was below the detection limit.

IEPA's Preliminary Hydrogeological Investigation of Dead Creek in 1980 was conducted for the purpose of determining possible sources of pollution observed in CS-8. The study included installation and

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TABLE B-4: ORGANIC ANALYSIS OF SEDIMENT
 SAMPLES FROM DEAD CREEK, SECTOR B
 (SPLIT SAMPLES-IEPA AND MONSANTO
 COLLECTED 10-2-80)

PARAMETERS	SAMPLE LOCATIONS			
	SD-1	SD-2	SD-3	Blank*
CHLOROBENZENES:				
Monochlorobenzene	(0.9)		(0.3)	
p-Dichlorobenzene	370	(0.3)	(0.4)	
o-Dichlorobenzene	80	(0.6)	1	
Trichlorobenzenes	85	1.6	(0.7)	
Tetrachlorobenzenes	6.1	2.4	(0.4)	
Pentachlorobenzene				
Hexachlorobenzene		1.2		
Polychlorobenzenes	120			
CHLOROPHENOLS:				
o-Chlorophenol	3.7			
p-Chlorophenol	6.6		(0.9)	
2,4-Dichlorophenol	1.2			
Pentachlorophenol	130		1.8	
PHOSPHATE ESTERS:				
Dibutylphenyl Phosphate	330		(0.8)	
Butyldiphenyl Phosphate			(0.8)	
Triphenyl Phosphate	2600			
2-Ethylhexyldiphenyl Phosphate			2.2	
Isodecyldiphenyl Phosphate				
T-Butylphenyldiphenyl Phosphate	28			
Di-t-butylphenyldiphenyl Phosphate				
Nonylphenyl Diphenyl Phosphate				
Cumylphenyldiphenyl Phosphate	3.7			
PCBs (C ₁₂ to C ₁₆ Homologs)	13,000	240	45	

NOTE: All values in ppm

*Soil blank collected from Missouri Bottoms, St. Charles, Mo.

Blanks indicate below detection limits

() Semi-quantitative values

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TABLE B-5: INORGANIC ANALYSIS OF SEDIMENT SAMPLES
FROM DEAD CREEK, SECTOR B
(SPLIT SAMPLES - IEPA AND MONSANTO
COLLECTED 10-2-80)

PARAMETERS	SAMPLE LOCATIONS			
	SD-1	SD-2	SD-3	Blank*
Aluminum	1,400	5,100	5,300	5,600
Antimony	13	240	160	29
Arsenic	210	40	55	5
Barium	770	1,200	1,300	130
Beryllium	-	-	-	-
Boron	28	160	100	27
Cadmium	5.1	60	55	3.9
Calcium	8,500	9,200	6,200	4,600
Chromium	25	110	240	19
Cobalt	15	180	120	33
Copper	460	28,000	18,000	19
Iron	4,700	53,000	30,000	9,900
Lead	180	2,000	1,600	50
Magnesium	460	2,200	2,000	2,300
Manganese	29	170	110	510
Molybdenum	6.1	92	68	11
Nickel	110	2,000	1,700	39
Phosphorus	2,500	13,000	9,400	610
Silicon	73	150	89	110
Silver	-	42	29	-
Sodium	400	540	410	320
Strontium	35	230	110	17
Tin	18	260	320	18
Titanium	32	110	80	37
Vanadium	34	140	130	130
Zinc	280	32,000	18,000	56

NOTE: All values in ppm

* Soil blank collected from Missouri Bottoms, St. Charles, MO.

- Indicates below detection limits.

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sampling of 12 monitoring wells in addition to the 1980 soil/sediment sampling described above. Residential wells were also sampled to determine ground water quality in the area. Locations of IEPA monitoring wells and residential well samples are shown in Figure B-2. All IEPA wells were screened in the Henry Formation sands, with screened interval elevations ranging between 366 and 402 feet Mean Sea Level. The hydraulic gradient in the vicinity of CS-B is very flat, with ground water flow generally to the west toward the Mississippi River.

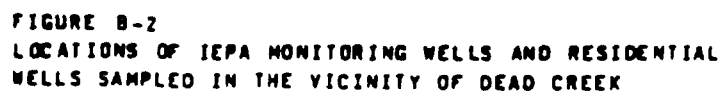
Analytical data for three sets of samples from the IEPA monitoring wells, corresponding to three sampling events in 1980 and 1981, are presented in Tables B-6, B-7, and B-8. Well G108 can be considered a background well due to its location upgradient from the known disposal areas around CS-B. Organic contaminants were consistently found in Wells G107 and G112. These wells are in downgradient monitoring positions for sites G and I respectively. Certain organic contaminants were detected in Wells G102, G109 and G110 during the initial sample event, but these wells did not show any of the organics in subsequent samples. Well G102 is located immediately west of the northern portion of CS-B, and near the southeast corner of Site G. Well G109 is located approximately 150 feet west of the former Waggoner surface impoundment (Site L). Well G110 is located downgradient of Site H. PCBs were detected at one time or another in Wells G101, G102, G104, G106, G107, G110, and G112. Of these, only G101 and G102 showed PCBs in all three sets of samples.

Inorganic analyses of samples from the IEPA monitoring wells indicate several parameters at concentrations above background (G108) and water quality standards. Standards for iron, manganese, and phosphorus were exceeded in samples from the background well. Barium, cadmium and lead were detected at concentrations exceeding standards in one or more well(s). In general, wells G109, G110, and G112 showed the most significant inorganic contamination. When compared with data for other wells, G109 contained very high concentrations of arsenic, copper, nickel, and zinc. The pH for G109

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TABLE B-6: ANALYSIS OF GROUNDWATER SAMPLES FROM THE IEPA MONITORING WELLS
(COLLECTED 10-23-80)

PARAMETERS	SAMPLE LOCATIONS														
	6101	6102	6103	6104	6105	6106	6107	6108	6109	6110	6111	6112			
ATRAITYNITY	302	410	336	406	271	307	352	375	287	210	302	899			
Ammonia	0.3	1.0	1.7	0.4	0.9	2.9	0.5	0.3	4.5	1.2	0.1	1.5			
Arsenic	0.023	0.023	0.043	0.049	0.067	0.16	0.043	0.008	0.055	0.053	0.008	0.019			
Barium	1.3	0.8	2.9	2.2	2.0	0.6	2.1	0.3	0.2	0.5	0.2	0.5			
Boron	0.5	0.4	0.5	0.6	0.4	0.5	0.5	0.4	0.4	0.5	0.5	5.6			
Cadmium	0.0	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.06			
Calcium	189	210	210	210	340	185	500	140	300	500	110	242			
Chloride	237	140	244	206	473	115	1070	298	275	700	79	162			
Chloride (Total)	48	103	58	52	65	109	132	79	69	61	32	363			
Chromium (V6)	0.04	0.02	0.09	0.04	0.12	0.01	0.07	0.0	0.0	0.38	0.0	0.01			
Copper	0.46	0.13	1.1	0.31	0.73	0.44	0.68	0.04	0.13	2.3	0.04	1.2			
Cyanide	0.4	0.7	0.7	0.3	1.0	0.7	0.7	0.3	1.2	0.8	0.3	0.0			
Fluoride	501	604	549	630	528	637	777	496	1664	279	419	1000			
Hardness	51.0	30.5	86	90	18	62	13	4.1	39.0	340	5	18			
Iron	0.10	0.15	0.26	0.2	0.31	0.0	0.27	0.0	0.0	7.3	0.07	0.44			
Lead	0.09	90	79	72	100	49	205	24	100	209	24	82.5			
Magnesium	5.1	3.8	4.2	3.4	4.2	1.9	3.8	8.90	4.5	8.0	1.1	3.9			
Mercury	0.0	0.0	0.0002	0.0	0.0	0.0	0.0	0.0001	0.0	0.0	0.0	0.0002			
Nickel	0.1	0.1	0.9	0.1	0.8	0.1	0.3	0.0	0.5	1.9	0.0	0.3			
Nitrate-Nitrite	0.1	0.1	0.1	0.4	0.0	0.1	0.1	1.1	0.0	0.4	0.5	0.0			
pH	6.6	6.6	6.5	6.6	6.6	6.5	6.4	6.6	6.3	6.7	7.0	6.4			
Phenolics	0.0	0.01	0.0	0.005	0.0	0.065	2.5	0.01	0.45	0.015	0.0	0.075			
Phosphorus	2.9	1.2	3.3	2.7	6.0	1.8	3.4	1.8	7.2	16	24	59			
Potassium	10.6	13.1	13.4	12.3	22	7.7	15.2	13.7	14.9	29	4.9	50			
R.O.E.	650	1230	765	790	824	1020	1230	704	2460	500	512	2130			
Selenium	0.003	0.001	0.004	0.01	0.008	0.001	0.004	0.001	0.001	0.005	0.002	0.001			
Silver	0.01	0.0	0.2	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.02	0.11			
Sodium	24	60	40	29	57	96	96	40	40	53	24	260			
S.T.C.	278	1800	1050	1000	1000	1300	1430	900	2970	700	990	3500			
Sulfate	132	434	230	204	296	281	281	103	1340	93	104	516			
Zinc	0.6	0.4	6.2	0.3	3.7	0.1	0.0	0.0	0.1	0.0	0.0	7.8			
PCB (ppb)	1.6	1.2	-	-	-	-	-	-	-	2.7	-	-			
Chlorophenol (ppb)	-	-	-	-	-	-	-	-	-	-	-	-			
Chlorobenzene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-			
Bichlorobenzene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-			
Bichlorophenol (ppb)	-	-	-	-	-	-	-	-	-	-	-	-			
Cyclohexanone (ppb)	-	-	-	-	-	-	-	-	-	-	-	-			
Chloroaniline (ppb)	-	-	-	-	-	-	-	-	-	-	-	-			

NOTE: All results in ppm unless otherwise noted.
 - Blanks indicate parameter not analyzed.
 - Indicates below detection limits.

TABLE B-7: ANALYSIS OF GROUNDWATER SAMPLES FROM THE IEPA MONITORING WELLS
(COLLECTED 1-28-81)

PARAMETERS	SAMPLE LOCATIONS											
	G101	G102	G103	G104	G105	G106	G107	G108	G109	G110	G111	G112
Alkalinity	247	421	243	528	353	555	521	428	17	308	394	519
Ammonia	0.3	0.0	1.4	0.2	0.7	3.3	1.0	0.0	0.0	0.2	0.1	0.5
Arsenic	0.015	0.016	0.018	0.002	0.037	0.11	0.021	0.004	7.5	0.013	0.014	0.027
Boron	0.9	1.2	0.9	0.3	1.8	1.6	3.2	0.5	0.2	1.0	0.7	0.5
Bromine	0.3	0.4	0.4	0.7	0.4	0.6	0.5	0.2	0.8	0.2	0.6	0.9
Cadmium	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00
Calcium	228.8	381.9	176.3	218.8	318.2	225.5	1158.5	205.5	465.7	159.4	181.4	198.3
C.F.D.	45	51	44	29	59	156	201	76	1315	37	28	47
Chloride	26	125	64	0.00	0.03	0.00	0.09	0.00	0.04	0.02	0.02	0.00
Chromium (total)	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	0.59	0.79	0.36	0.14	0.43	0.29	0.97	0.00	94.1	0.11	0.04	0.28
Cyanide	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hardness	554	1072	450	717	764	617	960	564	2144	447	530	406
Iron	30.4	14.5	20.8	1.4	60.8	67.5	172	0.3	198	19.1	10.1	18.9
Lead	0.17	0.00	0.00	0.00	0.07	0.00	0.32	0.00	0.00	0.00	0.00	0.00
Magnesium	48.2	74.0	45.3	49.1	73.6	49.1	288.1	34.3	184.4	43.5	37.9	54.0
Manganese	3.82	7.15	3.07	1.31	0.10	2.13	9.84	0.34	8.30	0.77	1.76	2.78
Mercury	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0004	0.0	0.0	0.0
Nickel	0.1	0.1	0.4	0.0	0.2	0.0	0.5	0.0	176	0.9	0.0	0.0
Nitrate-Nitrite	0.0	2.5	2.1	0.5	0.6	0.0	0.2	3.5	0.3	18	0.5	0.0
pH	7.0	7.0	7.1	7.2	7.0	6.9	6.9	7.1	4.1	6.9	7.0	6.9
Phenolics	0.0	0.0	0.0	0.0	0.0	1.46	0.5	0.01	1.06	0.02	0.015	0.05
Phosphorus	0.91	0.00	0.91	0.06	3.6	2.1	10	0.03	3.7	1.0	0.51	0.53
Potassium	6.4	12	6.8	6.0	13	6.2	20	16	18	7.5	4.2	20
Selenium	0.002	0.002	0.002	0.002	0.003	0.002	0.011	0.004	0.006	0.016	0.002	0.0
Silver	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sodium	13	63	40	15	50	94	60	30	37	13	14	10
Sulfate	129	583	256	265	468	143	276	86	3371	57	153	212
Zinc	0.3	1.2	1.8	0.1	1.5	0.1	1.8	0.6	10.1	2.0	0.1	2.8
PCB (ppb)	0.22	3.9	-	0.3	-	-	0.4	-	-	-	-	2.5
Chlorobenzene (ppb)	-	-	-	-	-	-	560	-	-	-	-	-
Dichlorobenzene (ppb)	-	-	-	-	-	-	90	-	-	-	-	-
Chloroethene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-

NOTE: All results in ppm unless otherwise noted.
 Blanks indicate parameter not analyzed.
 - Indicates below detection limits.

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TABLE B-8: ANALYSIS OF GROUNDWATER SAMPLES FROM THE IEPA MONITORING WELLS
(COLLECTED 3-10-81 - 3-11-81)

PARAMETERS	SAMPLE LOCATIONS											
	G101	G102	G103	G104	G105	G106	G107	G108	G109	G110	G111	G112
Atlatlilly	483	484	319	548	393	594	837	444	18	331	387	400
Arsenic	0.2	0.0	1.5	0.0	0.4	3.0	0.2	0.0	15	0.0	0.1	0.7
Barium	0.001	0.0	0.003	0.001	0.013	0.005	0.004	0.001	3.9	0.001	0.001	0.00
Boron	0.0	0.7	0.1	0.2	0.2	0.3	0.1	0.2	0.1	0.1	0.1	0.0
Cadmium	0.2	0.4	0.3	0.7	0.3	0.5	0.5	0.2	0.5	0.1	0.4	3.4
Cobalt	0.0	0.01	0.01	0.0	0.0	0.0	0.01	0.0	0.07	1.1	0.0	0.17
Calcium	104	333	151	206	218	175	386	148	431	121	164	207
Chloride	10	24	47	9	23	146	47	12	930	10	9	52
Chromium (Total)	16	124	46	20	57	150	235	51	24	27	16	133
Copper	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
Cyanide	0.04	0.06	0.00	0.02	0.02	0.01	0.01	0.03	67	0.02	0.07	0.46
Hardness	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iron	542	1062	620	839	796	675	1095	479	1651	424	485	789
Lead	0.3	0.3	1.6	0.0	9.4	4.9	2.4	0.0	1.4	0.0	0.2	0.5
Manganese	0.0	0.0	0.0	0.0	0.0	0.06	0.0	0.0	0.0	0.0	0.07	0.0
Nitrate-Nitrite	34.2	77.9	41.9	56.8	47	44.8	44.8	22.3	130	28.7	31.8	72
Phenolics	2.0	2.38	3.51	0.61	2.32	1.82	2.12	0.23	0.22	0.14	1.02	2.1
Potassium	0.0	0.3	1.1	0.0	0.2	0.0	0.0002	0.1	123	1.2	0.0	0.4
Selenium	0.0	1.1	0.0	2.3	0.0	0.0	0.0	0.3	0.3	15	2.7	0.2
Silver	6.9	6.0	6.0	6.9	6.8	6.7	6.7	7.0	4.6	6.6	6.8	6.6
Sulfate	0.0	0.0	0.005	0.0	0.0	0.0	1.7	0.1	1.4	0.0	0.0	0.00
Titanium	0.0	0.00	0.03	0.02	0.1	1.5	0.03	0.02	2.2	0.01	0.01	0.03
Zinc	4.0	10.0	10.4	5.9	0.9	5.7	2.8	18.2	6.4	6.3	2.9	40.2
Chromium (Total)	0.0	0.0	0.001	0.003	0.0	0.0	0.0	0.001	0.003	0.018	0.001	0.0
Silver	0.01	0.02	0.0	0.0	0.02	0.01	0.01	0.0	0.0	0.01	0.01	0.01
Sodium	11	64	65.6	17.4	51.2	92.6	39.2	25.2	12.1	14.2	15.5	96.6
Sulfate	118	617	471	303	445	145	313	55	2829	61	107	544
Zinc	0.1	0.0	2.0	0.1	0.3	0.1	0.1	0.3	6.3	1.8	0.1	11.8
PCB (ppb)	0.13	0.46	-	0.1	-	2.4	0.37	-	-	0.9	-	2.0

NOTE: All results in ppm unless otherwise noted.
 Blanks indicate parameter not analyzed.
 - indicates below detection limits.

MCA 0156828

was 6.3, 4.1, and 4.6 during the three sampling events. This indicates an unidentified source was releasing acid to the groundwater. Other wells which exhibited significant inorganic contamination include G102, G103, G105, and G106, all of which are located adjacent to CS-B along the west side. The data indicates non-uniform ground water contamination in the area, likely resulting from a variety of polluttional sources.

Private wells in the area have been periodically sampled by the IEPA and the USEPA. These wells are no longer used for potable water, but they are used for watering lawns and gardens. Locations of private well samples in the Dead Creek area are shown in Figure B-2. IEPA sampled five residential wells and collected one basement seepage sample near Creek Sectors B and C. Analytical data for these samples are presented in Table B-9. G504, located east of CS-B on Judith Lane, exceeded the standard for copper. The wells all showed water quality similar to that found in IEPA monitoring well G108, indicative of background conditions in the area. The basement seepage sample was collected from a residence on Walnut Street, just east of Site M. Analysis of this sample indicated higher levels of barium and copper, when compared with the private well samples. The seepage sample (x301) also showed a measurable level of chlordane, which was likely due to the application of commercial pesticides.

In March, 1982 the USEPA collected ground water samples from four private wells (S01, S02, S03, and S06) and two IEPA monitoring wells (S04 and S05). Ground water samples S04 and S05 correspond to IEPA monitoring wells G102 and G101 respectively. In addition, soil samples (S07 S10, S11) were collected from three gardens where well water is used for watering. Soil Samples S07, S010, and S011 were collected from gardens at the locations of ground water samples S01, S02, and S03 respectively (see Figure B-2 for approximate sample locations). Water and soil blank samples, R09 and R12 respectively, were also collected and analyzed. Analytical data for these samples are presented in Tables B-10 and B-11.

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B-16

MCO 7683614

TABLE B-9: ANALYSIS OF RESIDENTIAL WELL AND
SEEPAGE SAMPLES COLLECTED BY IEPA

PARAMETERS	SAMPLE DATES AND LOCATIONS					
	9/16/80 G501	9/16/80 G502	9/16/80 G503	9/23/80 G504	6/8/83 G505	1/5/83 x301
Arsenic	0.008	0.004	0.001		0.01	0.017
Barium	0.2	0.16	0.39	0.05	0.4	1.1
Boron	0.28	0.27	0.25	0.58	0.4	0.3
Cadmium						
Chromium						
Copper	0.02			0.06	0.01	0.03
Iron	4.6	19	17.7	0.73	26	31
Lead						0.03
Magnesium	33	39	36	30	35.3	54
Manganese	1.02	1.26	0.79	0.65	2.3	1.49
Mercury				0.0001		
Nickel				0.02		0.1
Phosphorus				0.02	0.62	1.2
Potassium	6.6	5.7	4.5	6	6.2	6.4
Silver						
Sodium	21	24	12	26	15.2	19
Zinc	0.85		0.18	0.8		0.7
PCBs	-	-	-	-		
Chlordane (ppb)	-	-	-	-		0.13

NOTE: All results in ppm unless otherwise noted
 Blanks indicate below detection limit
 - Indicates parameter not analyzed
 Sample x301 was collected from basement seepage

MCA 0150830

B-17

MCO 7683615

TABLE B-10: ANALYSIS OF IDENTIFIED ORGANICS IN GROUND WATER
AND SOIL SAMPLES IN THE VICINITY OF CREEK SECTOR B
(COLLECTED BY USEPA 3-3-82)

PARAMETERS	SAMPLE LOCATION										
	S01	S02	S03	Ground Water		S06	R09	S07	Soil		R012
				S04	S05				S010	S011	
bis(2-ethylhexyl) phthalate	64	62			19	a				a	0.44
di-n-butyl phthalate	a	a	a	a	11	a				a	a
diethyl phthalate	a	a	a	a			a				
3,4 benzofluoranthene	a										
benzo(k) fluoranthene	a										
butyl benzylphthalate				a			a				
methylene chloride	16	16	2300	3100	990	2000	19	1	0.1		0.75
1,2-dichlorobenzene				a							
1,4-dichlorobenzene				a							
chlorobenzene				a							
heptachlor				0.11b	0.146						
beta-BHC				0.18b	0.3b	4.04b					
gamma-BHC				0.16b	0.25b						
alpha-BHC					0.18b	0.25b					
aldrin				0.17b							
dieldrin								0.012		0.0046	
chlordane									0.11b		
heptachlorepoxyde						1.46b					
delta-BHC						0.95b					
fluoranthene							a			a	
benzo(a) anthracene							a			a	
anthracene							a			a	
pyrene							a			a	
Chrysene										a	0.02b

NOTE: All results in ppb
Blanks indicate below detection limit
a - Compound detected at value below specified contract detection limit
(compound identified as present, but not quantified)
b- value not confirmed by GCMS
Samples R09 and R012 are water and soil blanks, respectively

TABLE B-11: INORGANIC ANALYSIS OF GROUND WATER AND
SOIL SAMPLES IN THE VICINITY OF CREEK SECTION B
(COLLECTED BY USEPA 3-3-82)

PARAMETERS	SAMPLE LOCATIONS									
	501	502	GROUND WATER - In PPM		505	506	SOIL IN PPM		507	5012
Aluminum		400	503	504	505	506	507	508	509	510
Antimony			300		400	1,000	750	600	430	
Arsenic	11			29			1.3	1.0	80	
Barium							80	80	80	
Beryllium										
Boron	10,500	11,000	8,000	1,800	140	110	1.05	1.64	0.29	
Cadmium	4.2	14	31	5.3		2.8	2.2			3.2
Chromium	12									
Cobalt	42	70	82	95			16	24	13	
Copper	65						340	360	240	
Iron	65,000	31,000	30,000	28,000	530	250	(45)	(20)	(25)	
Lead	570	97	74	9	11	10	120	630	134	
Manganese	1,600	1,100	1,500	5,100	400	80				
Mercury										
Nickel	0.1	0.4	0.4	0.2	0.1		6.5	5.5	4	
Selenium										
Silver										
Thallium										
Tin										
Vanadium										
Zinc	107,000	109,000	40,000	1,900	260	350	96	77	130	

NOTE: Blanks indicate below detection limits
() - Results did not meet USEPA Quality Control criteria - Data unreliable
Duplicate analysis performed by USEPA central regional laboratory
Samples 509 and 5012 are water and soil blanks, respectively

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B-19

MCO 7683617

Quantified levels of bis-(2-ethylhexyl) phthalate were found in wells S01, S02, and S05. In addition, seven compounds from the pesticide fraction were detected in Wells S04, S05 (IEPA wells), and S06. Diethyl phthalate, butyl benzylphthalate, and methylene chloride were detected in the water blank, indicating that values of these parameters found in other samples should be disregarded. Methylene chloride was used to decontaminate sampling equipment, and concentrations of this parameter in all samples should not be considered indicative of aquifer conditions. Water quality standards for lead and cadmium were exceeded in one or more wells.

The soil samples showed trace levels of chlordane and dieldrin. It could not be determined if levels of pesticides found in the gardens soils were attributable to the use of well water or application of commercial pesticide products to the gardens. Phthalates, methylene chloride, chrysene, and chromium were detected in the soil blank (R012), and these compounds should be disregarded in other samples.

In September and October, 1980 IEPA conducted preliminary air monitoring in CS-8. The survey included use of detector tubes (Drager) for halogenated hydrocarbons, and collection of air samples in charcoal tubes with subsequent laboratory analysis. The detector tubes showed positive readings for hydrocarbons in the northern portion of CS-8, adjacent to the former Waggoner Building. Results were not quantified, and negative readings were observed in all other areas surveyed. Air samples were collected from two locations in CS-8 using charcoal tubes and sampling pumps. Two samples were collected from each location in order to monitor conditions for undisturbed and disturbed soil. Samples from the first location, 40 yards south of Queeny Avenue, showed no positive readings for volatile organic compounds (VOCs) for disturbed or undisturbed soil conditions. Xylene was detected for disturbed and undisturbed soil conditions at the second sampling location, which was 60 yards north of Judith Lane, adjacent to Site M. All samples were extracted and analyzed at IEPA's Springfield Laboratory.

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B-20

MCO 7683618

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A USEPA Field Investigation Team (FIT) contractor also performed an air monitoring survey in the creek bed in March, 1982. This survey involved the use of an organic vapor analyzer (OVA), an HNU photoionizer, and Drager detector tubes for phosgene gas. Results indicated that a small, but measurable, concentration of organic vapors were present in the breathing zone (5 feet above ground surface), with concentrations increasing closer to the creek bed. In the breathing zone, the OVA showed readings up to 0.5 ppm above background, and the HNU readings were as high as 9 ppm above background. The survey crew also observed a 3-inch effluent pipeline adjacent to the former Waggoner Building which was discharging a small stream of oily liquid. OVA and HNU readings were taken approximately 6 inches from the surface where this liquid had pooled. The OVA showed concentrations up to 350 ppm, and the HNU showed concentrations ranging from 400 to 900 ppm in this area. Phosgene gas was not detected in any area using the Drager tubes.

HRS scores have been calculated on two separate occasions for Dead Creek. The creek was first scored in July, 1982, by Ecology & Environment, Inc., with a final migration score of 18.48. The site was again scored in March, 1985 by IEPA in an attempt to increase the previous score. IEPA's assessment led to a final score of 29.23, however, this score has not been finalized by USEPA. Route scores for the 1982 assessment were as follows: ground water 4.24, surface water 7.55, and air 30.77. Corresponding route scores in the 1985 assessment were 5.65, 10.07, and 49.23. Observed releases were used for all route scores in both the 1982 and the 1985 scoring packages. The only difference in the assessments was in the value assigned for waste quantity in the three routes. The 1982 package listed waste quantity as unknown (assigned value - 0), while IEPA calculated an approximate volume of waste based on sample results and visual observations.

A significant amount of data has been developed showing a wide range of contaminants in and around CS-8. Review of existing file data indicates numerous possible sources of contamination in the area.

B-21

MCO 7683619

MCA 0156834

Prior to blocking the culvert at Queeny Avenue, Cerro Copper and Monsanto Chemical reportedly discharged process wastes directly into the creek. According to past IEPA inspection reports the former Waggoner Company, an industrial waste hauling operation, discharged wash waters from truck cleaning activities directly to CS-8. After IEPA order Waggoner to cease this practice, an unlined surface impoundment was apparently used for disposal of wash water. In the 1940s and 1950s sites H and I were used for disposal of various industrial wastes. These sites were actually a single, large disposal area prior to the construction of Queeny Avenue in the late 1940s. In the 1950s, the Midwest Rubber Company, located west of State Route 50 and south of Queeny Avenue, had an effluent pipeline which ran from their plant location to the northern portion of CS-8. Midwest Rubber Co. reportedly discharged process wastes, including oils and cooling water, to the creek. Site G is a surface/subsurface disposal area with corroded drums and other wastes exposed on the surface. Surface drainage for at least a portion of this site is directed to CS-8.

Data Assessment and Recommendations

The scope of field investigation work for CS-8 during the Dead Creek Project includes collecting three surface water samples from the Creek in Sector 8. This sampling program should be sufficient to characterize the water currently in the creek. Soil gas and ambient air monitoring will also be done in and around CS-8.

Although a great deal of data is available for CS-8, most of the data is 4-6 years old. Because of the dynamic nature of the creek and disposal activities in the area, existing conditions may not be accurately characterized by historical sampling data. Feasibility study activities for CS-8 could be accomplished using existing data and applying assumptions concerning chemical profiles (contaminant distribution). However, to properly accomplish the feasibility study activities, a current chemical depth profile of the creek bed should be developed. This would consist of collecting

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MCO 7683620

sediment and subsurface soil samples from several locations in the creek bed and along the banks. The hydrology of the area has not been well-defined and should be addressed further. It has not been established whether the ground water discharges to Dead Creek or the creek acts as a recharge conduit for the Henry Formation aquifer. If discharge to the creek is occurring, the subsurface disposal areas (Sites H and I in particular) may be major contributors to the contamination of the creek.

Accordingly, existing IEPA monitoring wells on both sides of the creek should be redeveloped to allow for accurate water level measurements. This, in conjunction with detailed surveying of the creek bed and water levels in the creek, would allow adequate assessment of the hydrology in the area. This would be best accomplished using continuous-recording water level instrumentation, and should be continued over a period of time sufficient to address seasonal fluctuations. In addition, records of industries in the area should be thoroughly reviewed to establish a profile of possible releases from each source.

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B-23

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MCO 7683622

SITE M. HALL CONSTRUCTION PIT

Site Description

Site M is a sand pit excavated by the H.H. Hall Construction Company in the mid to late 1940's. The pit is located immediately east of Dead Creek, and approximately 300 feet north of Judith Lane in Cahokia, Illinois (Figure M-1). The dimensions of the pit are approximately 275 by 350 feet. Presently, Site M is enclosed by a chain link fence, which also surrounds Creek Sector B. A small residential area is located just east of the pit on Walnut Street, which earlier served as an access road to Site M. The pit was excavated prior to any residential development on this street. Observations suggest that the pit is apparently isolated from Dead Creek by an embankment; however, this embankment may not be continuous. Aerial photographs indicate that a small break in the southern part of the embankment may allow flow between the creek and Site M. This possibility is supported by past IEPA inspections, indicating discoloration in the pit similar to that observed in Dead Creek.

Site History and Previous Investigations

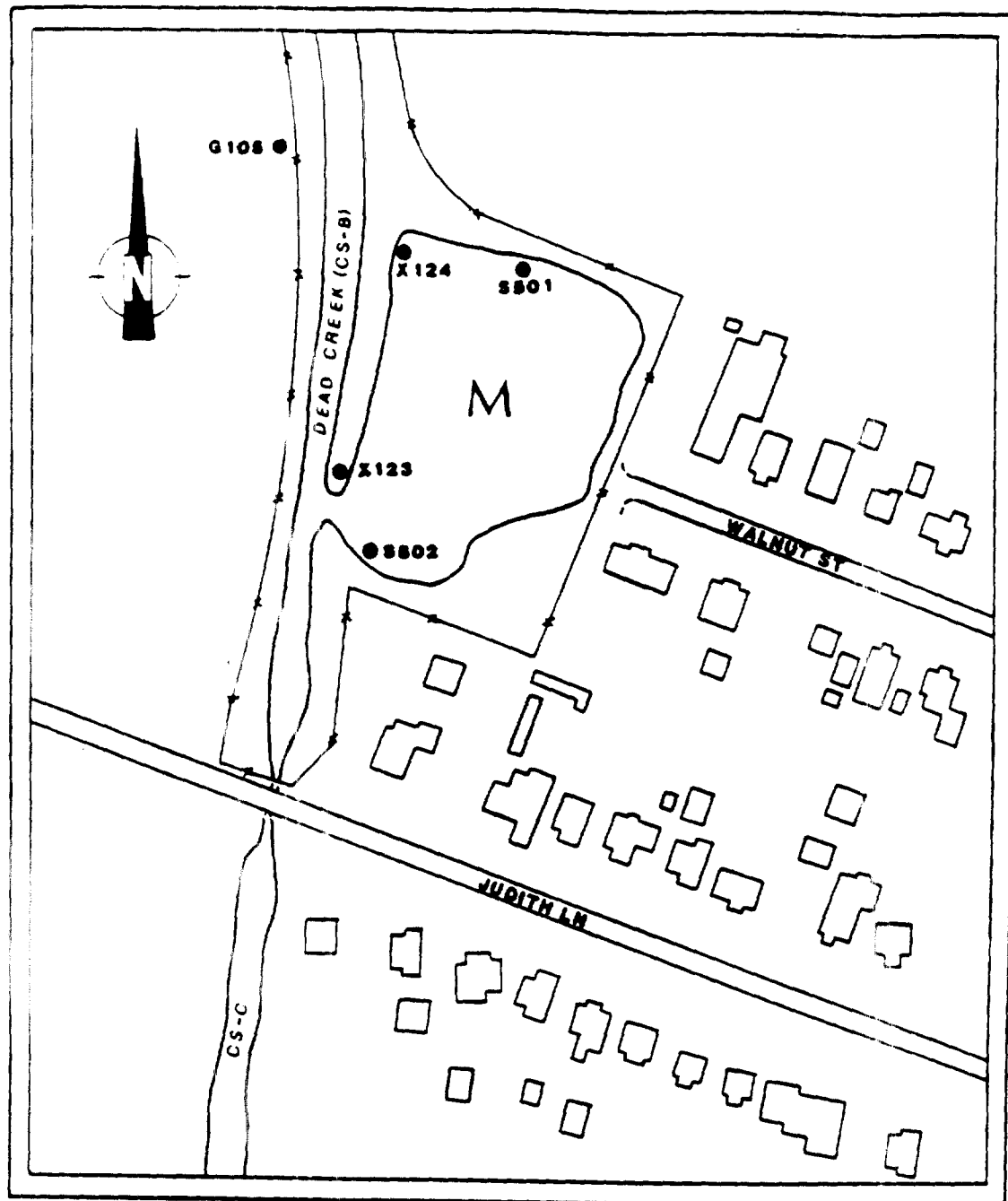
No information is available on file concerning waste disposal activities at Site M. It is possible that disposal did occur, since access to the pit remained unrestricted until a snow fence was erected in 1980. From review of historical aerial photographs, it is evident that minor changes in the dimensions of the pit have occurred. This could be an indication of filling around the perimeter of the pit. IEPA and the Cahokia Health Department have received numerous complaints about Site M and the creek from residents in the area. These complaints address, for the most part, seepage of odoriferous water into basements and problems associated with well water used to water gardens and lawns.

IEPA sampled several private wells in the area during the preliminary

M-1 MCA 0156838

MCO 7683623

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SCALE
0 150 600 FEET

LEGEND
G105 EPA MONITORING WELL
X124 EPA SEDIMENT SAMPLING LOCATION
S502 EPA SURFACE WATER SAMPLING LOCATION

FIGURE M-1
DEAD CREEK SITE AREA M WITH SAMPLING LOCATIONS

M-2

MCA 156839

MCO 7683624

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hydrogeological study conducted in 1980. In addition, one sample of basement seepage from a home on Walnut Street near Site M was collected. Analytical results of these samples are presented in Table B-9, located in the Creek Sector B portion of the report. The results show concentrations of copper, manganese, and phosphorus above the state's water quality standards in one or more wells as well as in the basement seepage sample.

In conjunction with the creek sampling done in 1980, IEPA collected sediment and water samples from Site M. Analytical data for these samples are presented in Table M-1. In general, the water samples showed no significant contamination, although water quality standards for copper, phosphorous, and zinc were exceeded. Trace levels of PCBs (0.9 to 4.4 ppb) were found in both samples. The sediment samples, however, did show fairly high levels of several contaminants, including cadmium, chromium, copper, lead, nickel, zinc, and PCBs. In general, the samples closer to the break in the embankment separating Site M from Dead Creek showed higher levels of contaminants than the other samples.

Because water levels in the pit were approximately two feet higher than those found in the closest monitoring wells, the IEPA study concluded that there is no hydrological connection between water in the pit and the ground water aquifer. This assessment may or may not be accurate.

Data Assessments and Recommendations

The IEPA study conducted in 1980 showed significant contamination at Site M and identified specific waste types present. Investigation of Site M for the Dead Creek Project includes collecting two surface water and three sediment samples. A soil gas survey and ambient air monitoring will also be conducted at Site M. This sampling program will not provide sufficient data to adequately evaluate remedial alternatives. Core samples should be collected from the bottom of the pit in order to determine the types of wastes present and the

M-3

MCO 7683625

MCA 0156840

TABLE M-1:

ANALYSIS OF SURFACE WATER AND SEDIMENT SAMPLES FROM SITE M
(COLLECTED BY IEPA 9-15-80)

PARAMETERS	SAMPLE LOCATIONS			
	<u>Water</u>		<u>Sediment</u>	
	S 501	S 502	X 123	X 124
Alkalinity	80	85		
Arsenic	0.006	0.01		
Barium	0.2	0.5	4,400	350
Beryllium			3	1
BOD-5	4	33		
Boron	0.2	0.2	-	25
Cadmium	-	-	40	4
Calcium			12,500	4,500
COD	58	85		
Chloride	27	28		
Chromium	-	-	150	50
Copper	0.035	0.33	18,700	4,500
Cyanide	0.02	-		
Flouride	0.4	0.4		
Iron	0.8	1.8	49,000	13,500
Lead	-	0.01	1,400	130
Magnesium	6	6	3,400	3,500
Manganese	0.06	0.82	200	80
Mercury	-	-		
Nickel	0.02	0.05	1,600	590
Phenol	0.01	0.01		
Phosphorus	0.17	0.31		
Potassium	5.9	6.2	950	1,000
Silver	-	-	30	6
Sodium	24	25	650	100
Strontium			175	27
Vanadium			42	19
Zinc	0.1	0.7	17,700	2,600
PCBs	0.0009	0.0044	1,100	24
Dichlorobenzene				

NOTE: All results in ppm.
Blanks indicate parameter not analyzed.
- Indicates below detection limits.

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M-4

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extent of vertical migration of contaminants that has occurred. In addition, several borings should be completed around the perimeter of the pit, including the embankment between the pit and the creek. It would also be necessary to verify that there is no hydrological connection between the water in the pit and the ground water aquifer. This would be best accomplished using continuous recording gauging stations at wells in the vicinity of the creek and at the pit. These activities would provide the information necessary to proceed with a viable remedial program.

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M-5

MCO 7683627